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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,873	07/03/2006	Rachel Butler	T3140(C)	9573
201	7590	07/29/2010	EXAMINER	
UNILEVER PATENT GROUP			NEGRELLI, KARA B	
800 SYLVAN AVENUE				
AG West S. Wing			ART UNIT	PAPER NUMBER
ENGLEWOOD CLIFFS, NJ 07632-3100			1796	
			NOTIFICATION DATE	DELIVERY MODE
			07/29/2010	ELECTRONIC

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POROUS MATERIAL AND METHOD OF PRODUCTION THEREOF

ADVISORY ACTION

Response to Arguments

1. Applicant's arguments filed July 19, 2010 have been fully considered but they are not persuasive.
2. Applicant argues that Ko et al. is limited to crosslinked, water-insoluble porous products for use as absorbent articles, while the instant application teaches water-soluble porous polymeric materials.
3. While the porous products of Ko et al. are used as absorbent materials (such as bandages and/or wound dressings, see paragraph [0010] of Ko et al.), there is no recitation that the products must be water-insoluble anywhere in the disclosure in the invention. Furthermore, like the materials of Ko et al., the instant specification teaches that the materials of the instant invention are useful as absorbents (page 10, first full paragraph, line 4 of the paragraph) or wound-healing matrices (page 10, first full paragraph, lines 5-6 of the paragraph). Instant claim 30 further teaches that the porous, water-soluble materials of the invention may be used to produce absorbents. The examiner would also like to note that instant claim 1 does not indicate to what extent the porous material of the invention dissolves in water, or at what temperature or length of time.
4. Applicant points to paragraph [0007] to support that the materials of Ko et al. must be water insoluble. Paragraph [0007] describes the state of the art in general and is not directed solely to the invention of Ko et al. Paragraph [0007] states: "Traditional

High Internal Phase Emulsion foams (HIPE), particularly water-in-oil emulsion systems, have been proposed for many uses, including absorbent articles. The monomer and crosslinking agents are present in the oil phase, while an electrolyte can be present in the water phase in water-in-oil emulsion systems." See paragraph [0007].

5. The applicant is absolutely correct in stating in paragraph 2, page 10 of the arguments filed July 19, 2010, that Ko et al. states that the invention of Ko et al. is directed towards methods of making polymeric foams in which the oil in a water-in-oil emulsion is partially or completely replaced with super critical fluids such as CO₂ (thus producing a C/W emulsion) which is exactly what is proposed by the instant invention. Paragraph [0008] does not state anywhere in the paragraph that a monomer is present with a crosslinking agent, as asserted in paragraph 3, page 10 of the arguments filed on July 19, 2010.

6. While the applicant may be correct in stating that paragraph [0019] defines what is meant by rubbery polymers, paragraph [0019] does not state that a crosslinking agent must be present in the material of the invention, nor does paragraph [0022]. Paragraphs [0019] and [0022] are merely used to define terms of the invention of Ko et al. It is further noted that the "rubbery monomer" described in Ko et al. may comprise 2-ethylhexylacrylate, which the instant specification describes as a component which may be used to produce the matrix building material of the invention, and which the instant specification further describes as a polymeric material which is "substantially free of cross-linking" and is "water-soluble" (see page 6 of the instant specification). Thus, the

"rubbery monomer" of Ko et al. which may comprise 2-ethylhexyl acrylate, does not necessarily imply a crosslinked material, as asserted by the applicant.

7. It is once again noted that paragraph [0022] of Ko et al. defines what is meant by "crosslinking monomer" and further states that "a crosslinking agent may also be added to crosslink the polymerized material," implying that the crosslinking agent is an optional component. Applicant further asserts that paragraph [0027] defines what is meant by absorbent capacity, and states that "to be able to measure such a property, the absorbent material in Ko et al, simply cannot dissolve on contact with water." Applicant has not provided any factual evidence that this statement is correct. It is once again noted that the "water-soluble" materials of the instant invention may also be used as absorbents. The phrase "water-soluble" does not indicate that a material must instantly dissolve upon contact with water. "Water-soluble" merely indicates that a material is capable of such dissolution, as admitted by applicant on page 11, paragraph 1 of the arguments filed July 19, 2010, where the applicant provides a definition of water-soluble. Therefore, the method by which a materials' absorbent capacity is measured not does indicate that the material is water-insoluble. It indicates that the material does not instantly dissolve upon exposure to water (which is not required by the instant claims).

8. Paragraph [0037], like paragraph [0007], describes HIPE emulsions in general, and states that HIPE emulsions may additionally comprise a monomer component as described on pages 11-12 of the arguments filed July 19, 2010, making this component optional. Paragraph [0038] does not state anywhere that this monomer component is

required as asserted by the applicant. Applicant asserts that "use of the word 'may' refers to the percentage of each of the components (1), (b) and (c)...and not to their inclusion per se." However, applicant has not provided evidence that this is the case. Given the teaching in Ko et al., one of ordinary skill in the art could reasonably interpret "may" to indicate that that the monomer component described in Ko et al. is optional, and that "may" refers to the components themselves and not to their amounts.

9. The statement that "the chemical nature, makeup, and morphology of the polymer material which forms the inverse HIPE foam structures of the present invention is determined by the types and quantity of the monomers, comonomers, and crosslinkers utilized in the emulsion" is not sufficient evidence that the a crosslinking agent is "an essential component" in the invention of Ko et al, as asserted by the applicant. This paragraph does not indicate that any specific quantity of crosslinking agent must be present. It merely teaches that the amounts of these components will affect the structure of the resulting foam.

10. As to the four tests described by the applicant, it is once again noted that measuring absorbent capacity certainly does not mean that the material is not water-soluble (especially given that the water-soluble materials of the invention may be used to produce absorbents, as described above and as claimed in instant claim 30). The phrase "water-soluble" does not indicate that a material must instantly dissolve upon contact with water. "Water-soluble" merely indicates that a material is capable of such dissolution, as admitted by applicant on page 11, paragraph 1 of the arguments filed July 19, 2010, where the applicant provides a definition of water-soluble. Therefore, the

method by which a materials' absorbent capacity is measured not does indicate that the material is water-insoluble. It indicates that the material does not instantly dissolve upon exposure to water (which is not required by the instant claims). The same is true of the remaining three tests described by the applicant. Furthermore, the instant claims do not recite at what temperature the porous materials are water-soluble. Temperature plays a role in whether a material "dissolves in water" and also affects the rate at which it dissolves.

11. Applicant states that "...soluble, absorbent polymers simply do not exist." The examiner would like to respectfully point out that if this were the case (and it is not for the reasons provided above), an enablement issue within the disclosure of the instant invention would be present, given that the instant specification explicitly teaches that the water-soluble porous materials of the instantly claimed invention may be used to produce absorbents. See page 10, lines 1-2 of the first full paragraph and line 4 of the first full paragraph, as well as instant claim 30). Furthermore, solubility (in water) of polymeric materials is affected by a number of factors, such as temperature and length of exposure, so a statement that "water-soluble absorbent polymers do not exist" is simply incorrect.

12. Once again, with regards to applicants' arguments against Butler individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Note that while Butler may not disclose all the features of the present

claimed invention, Butler is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nievelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, porous materials comprises from 5-20% w/v of matrix building material, from 5-20% w/v surfactant in respect of water, and 65-95% CO₂, and in combination with the primary reference, discloses the presently claimed invention.

13. As discussed in the previous office action, Ko et al. teach an identical process with identical components as are taught in the instant claims. Ko et al. teach compositions comprising replacing the oil in an oil-in-water emulsion with supercritical fluids, such as CO₂, that are non-toxic, environmentally friendly, more soluble, and cost effective (paragraph [0007]). After polymerization, the CO₂ is easily extracted from the polymer as a gas (paragraph [0008]). The supercritical CO₂ causes swelling of the polymeric matrix, allowing diffusion of surface active agents or other active components into the matrix in the swollen state, wherein upon depressurization, the matrix deswells and entraps the active components to modify properties of the foam (paragraph [0008]). By controlling the nature of the emulsion, and the polymerization process, nanopores can be created (paragraph [0008]). Ko et al. further teach that by depressurization, the CO₂ is vented away, and all or a portion of the oil phase is removed (paragraph [0044]). Solvents, particularly those used in the liquid form, can be removed by freeze-drying (meaning the aqueous phase would at this point be at least partially frozen) (paragraph [0032]). This method is exactly described in the instant claims.

14. Ko et al. additionally teach that operations such as vacuum removal, removal driven by air pressure, pressing the foam, or other methods can be used to remove the oil phase, the supercritical fluid, remaining water, emulsifier, initiators, or any other unpolymerized material from the foam (i.e. there would be no solvent residue remaining in the material) (paragraph [0044]).
15. Ko et al. further teach the use of surfactants such as polyoxyethylene sorbitan monolaurate and polyoxyethylene sorbitan monopalminate (Tween 40) (paragraph [0021]). Further additives can also be used in the composition, such as solid metal nanoparticles (pertaining to instant claims 2-6 and 19-20), such as hydrophilic titanium oxide, silica, and the like (paragraph [0048]), as well as copper hydroxide or zinc hydroxide (organic reagents) as antimicrobial and/or odor control agents (paragraph [0065]).
16. Examples of the monomers to be polymerized for the composition of Ko et al. include polycarboxylic acid such as acrylic acid, vinyl lactams, aromatic vinyl sulfonic acids, carboxylic acid salt-containing monomers, N-hydroxyalkyl acrylamides (polyacrylamides, which the instant application recognizes is a water soluble matrix building material), methacrylic sulfonic acids, or acrylic sulfonic acids, (paragraph [0053]). The monomers are to be dispersed within the water phase of the invention (paragraph [0053]). The composition of may further comprise cellulosic fibers (paragraph [0049]). Because Ko et al. teach that these water soluble polymers may be dispersed in the aqueous phase of the emulsion, and because Ko et al. teach that carbon dioxide may completely substituted for the oil phase in a water-in-oil HIPE

emulsion, and because crosslinking agents *may* be added to the composition (making them optional), the compositions of Ko et al. may be water-soluble porous materials. Ko et al. also teach that the porous materials may be molded into any desired shape (paragraph [0068]) (which would include a monolithic block, as described in claims 17 and 25).

17. Ko et al. further teach that the polymeric foam is used to produce absorbent articles (paragraph [0063]), including bandages or wound dressings (wound healing matrices) (paragraph [0010]). The instant invention may also be used in identical applications (see page 10, second full paragraph of the instant specification). Instant claim 30 further teaches that the porous, water-soluble materials of the invention may be used to produce absorbents.

18. The foams produced according to the invention of Ko et al. have pore volumes of from 6 cc/g to 200 cc/g. The bulk density would therefore be 1/200 g/cc to 1/6 g/cc, or from 0.005 to 0.16 g/cc (paragraph [0028]). The polymeric foam further has an average cell size of 50 microns or less (paragraph [0038]). These ranges overlap the values given in instant claim 23.

19. Therefore, given that Ko et al. may comprise the same amounts of the same materials used to produce an identical article via an identical method as is disclosed in the instant application, it is unclear how the materials of Ko et al. will have different properties than the instantly claimed material as asserted by the applicants.

20. What is lacking from Ko et al. is the amounts of matrix building material, surfactant, and carbon dioxide. Ko et al. also do not expressly teach that the method for

producing the porous materials described above comprises from 5-20% w/v of matrix building material, from 5-20% w/v surfactant in respect of water, and 65-95% CO₂.

21. However, Butler et al. (2001) (*Advanced Materials* 2001, 13, 1459-1463) teaches CO₂-in-water emulsions comprising 70% to 80% CO₂, 10% w/v poly (vinyl alcohol) relative to water, and 1 to 10% surfactant w/v based on water (page 1460, column 2, paragraph 2, lines 1-4 and page 1461, paragraph 2, lines 5-8). It would have been obvious for one of ordinary skill in the art to use the concentrations of each component as specified by Butler et al. (*Advanced Materials* 2001, 13, 1459-1463) in the invention of Ko et al. because using the concentrations results in a system in which free-radical polymerization occurs before the emulsion becomes destabilized (Butler et al., *Advanced Materials* 2001, 13, page 1460, column 2, paragraph 2, lines 9-12). Addition of polyvinyl alcohol further counteracts destabilization when added to the aqueous phase of the emulsion before polymerization, resulting in an emulsion sufficiently stable for producing open-cell porous materials (Butler et al., *Advanced Materials* 2001, 13, page 1461, column 1, paragraph 2, lines 5-12). While Butler et al. teach that crosslinked acrylamide based polymers may be used to produce the porous materials, Butler et al. further teach that the invention may be applied to a much wider range of materials (page 1460, paragraph 3), such as 2-hydroxyethyl acrylate. The substitution of acrylamide with 2-hydroxyethyl acrylate led to porous, open-cell materials suggesting that the technique described by Butler may be applied to a wide range of hydrophilic and hydrogel materials. Butler also teaches that water-soluble materials are

desirably used in the formation of the materials of the invention, see phage 1460, third full paragraph.

22. Both Butler et al. and Ko et al. are from the same field of endeavor: porous materials such as foams produce using CO₂ –in- water- emulsions. (See paragraph [00008] in Ko et al. and the first full paragraph of Butler et al., *Advanced Materials 2001*, 13, page 1460). It would have been obvious for one of ordinary skill in the art to use the materials of Butler et al. in the method of Ko et al. because the materials of Butler et al. lend to defined porous structures without the use of any volatile organic solvents. Additionally, paragraph [0009] of Ko et al. teaches that the “Emulsion Templating Using Supercritical Fluid Emulsions” article by Butler et al. is incorporated by reference, as the technologies of Butler et al. can be adapted to improved HIPE polymerization processes used in the production of foams for absorbent articles, particularly using supercritical carbon dioxide to replace the oil phase in the HIPE foam-production processes to produce foams having higher capillary tension or other improved physical and interfacial properties relative to past HIPE foams.

23. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a

reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

24. For all of the reasons provided above, applicants' arguments filed July 19, 2010 are not persuasive.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KARA NEGRELLI whose telephone number is (571)270-7338. The examiner can normally be reached on Monday through Friday 9:30 am EST to 6:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (571)272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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